distribution of bituminous material or lack of bond to underlying stone.

The outstanding features of a method of construction that will eliminate by prevention the failures due to these causes, as shown by experiment and experience, are:

First. The preparation of a well-drained and thoroughly compacted subgrade;

Second. The use of uniform large-sized stone, 1½ to 2½ inches, in the top, or wearing, course;

Third. The use of a bituminous binder that is tough, fairly hard, and which sets up quickly;

Fourth. The application of the bituminous material by an air pressure distributor, instead of by hand pouring.

A method embodying these essential features has been in use in Massachusetts for the past few years and has given excellent results. Too great stress, however, cannot be laid on careful attention to details.

Thorough drainage is even more essential in bituminous construction than in water-bound macadam or earth roads, since in the former the surface is impervious to moisture, and the water which gets underneath cannot dry out through the road, but must be entirely taken care of by drainage. Where the subsoil is naturally well-drained, a broken stone base can be used. The subgrade must be thoroughly rolled with a 12-ton roller until no further settlement is discernible. The base may be laid with broken stone, varying in size from 1½ to 2½ inches, to such a thickness as will compact under the roller to about 4 inches. After thoroughly rolling, the voids are partly filled with stone screenings, and the whole course rolled again. It is very important to roll this bottom course until it is well compacted and shows no movement under the roller, otherwise depressions will appear in the wearing surface. Where these depressions appear in the base, level up with stone and roll again.

If the subgrade is of a spongy character which will not compact under the roller, or which is not naturally well-drained, it will be necessary to use a 4-inch concrete base laid in the usual manner and with the surface roughened by tamp-